



United States Patent [19]
Ward

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[54] **MULTI-LAYER FORMING FABRIC WITH STITCHING YARN PAIRS INTEGRATED INTO PAPERMAKING SURFACE**

[75] Inventor: **Kevin J. Ward, Nova Scotia, Canada**

[73] Assignee: **Weavexx Corporation, Wake Forest, N.C.**

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[52] U.S. Cl. **139/383 A**

[58] Field of Search **139/383 A**

[56] **References Cited**

U.S. PATENT DOCUMENTS

Re. 35,777	4/1998	Givin	139/383 A
3,325,909	6/1967	Clark	
4,501,303	2/1985	Osterberg	
4,605,585	8/1986	Johansson	
4,739,803	4/1988	Borel	
4,759,975	7/1988	Suberland et al.	
4,987,929	1/1991	Wilson	
5,152,326	10/1992	Vohringen	
5,518,042	5/1996	Wilson	
5,564,475	10/1996	Wright	
5,709,250	1/1998	Ward et al.	139/383 A
5,826,627	10/1998	Seabrook et al.	139/383 A

FOREIGN PATENT DOCUMENTS

0 224 276	12/1986	European Pat. Off.	
0 408 849 A2	11/1990	European Pat. Off.	
0 408 849 A3	11/1990	European Pat. Off.	
0 794 283 A1	9/1997	European Pat. Off.	
2 597 123	10/1987	France	
454 092	8/1927	Germany	
WO 86/00099	3/1986	WIPO	

OTHER PUBLICATIONS

International Search Report for PCT Application No. PCT/US97/18629.

Primary Examiner—Andy Falik
Attorney, Agent, or Firm—Myers Bigel Sibley & Sajovec

[57] **ABSTRACT**

A multi-layer papermaker's forming fabric has stitching yarns integrated into the papermaking surface. Each of a plurality of repeating units of the fabric comprises: a set of top machine direction yarns; a set of top cross-machine direction yarns interwoven with the top machine direction yarns; a set of bottom machine direction yarns; a set of bottom cross-machine direction yarns interwoven with the bottom machine direction yarns; and pairs of first and second stitching yarns. The stitching yarn pairs are positioned between pairs of top cross-machine direction yarns. The stitching yarns of each pair are interwoven with the top and bottom machine direction yarns such that, as a fiber support portion of the first stitching yarn is interweaving with the top machine direction yarns, a binding portion of the second stitching yarn is positioned below the top machine direction yarns, and such that as a fiber support portion of the second stitching yarn is interweaving with the top machine direction yarns, a binding portion of the first stitching yarn is positioned below the top machine direction yarns. The first and second stitching yarns cross each other as they pass below a transitional top machine direction yarn. Also, each of the binding portions of the first and second stitching yarns passes below at least one of the bottom machine direction yarns. In this configuration, the stitching yarns are completely integrated into the top, or papermaking, surface of the fabric, and therefore do not adversely impact the papermaking qualities of the fabric.

15 Claims, 6 Drawing Sheets

